# W6IFE San Bernardino Microwave Society Newsletter

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The 7 May 1998 meeting tech talk will be Eric, KD6GLP and Jeff, KN6VR on video transmission link hardware. The SBMS meets at the American Legion Hall 1024 Main Street (south of the 91 freeway) in Corona, CA at 1930 hours local time on the first Thursday each month.

Last meeting-Chuck, WA6EXV provided a very nice slide show on antennas and a way to measure them. Chuck provided some examples of his measurements on antenna feeds and dishes with feeds. Of interest was the offset feed 18 inch DSS which is a piece of a normal parabolic. Chuck pointed out that pointing the feed at the center of the DSS gave a little more than 1 dB higher gain than what one would expect than if you pointed at the bottom part of the DSS which is the center of the normal parabolic. Thanks Chuck. Dave, K6OW and Robin, WA6CDR are working on ARRL contest rules letter. A committee is looking into the joint SBMS/ San Diego antenna party location for some time in early fall. Possible location maybe to use PV beacon (modified)for signal source. Chuck, WA6EXV still planning on being on Cory PK, NV DM08pq for the June contest with 2 to 24 Ghz rigs. NJ6A to be in Utah. Ed, W6OYJ emailed that the George logs could be turned in by 15 April if request for extension was filed with the proper fee. 24 people present.

1998 SBMS Officers Elected- the following were elected to office by the railroad: President, Dick, WB6DNX; Vice President Ken, WB6DTA; Recording Secretary Eric, KD6GLP; Corresponding Secretary Larry, K6HLH; treasurer Dick, K6HIJ; Editor Bill, WA6QYR.

Activities reported at the April meeting - Phil, W6HCC was visiting from CO-his new home has good view and there are at least 4 hams on 10 Ghz nightly for QSO's, he can see Pikes Pk and several others from home station; Frank, WB6CWN stopped by; Chuck, WA6EXV put the antenna talk together and has been working on 2.3 Ghz conversions for the WB6DNX 2 Ghz equipment and had contacts with WA6QYR during the George event; Bill, WA6QYR has been measuring and making schematics of the WB6DNX 2 Ghz equipment and had QSO's during the George; Dick, WB6DNX built the 1.2 and 2.3 Ghz loop yagis and has been working with the excess 2 Ghz

equipment and has heard the Heaps beacon with the 2 Ghz equipment rig; Bob, W6SYA making mods to the Qualcomm rig and built the WA6EXV 3 stage filter; Doug, K6JEY picked up some 24 Ghz stuff and wrote an article for QST and has another article in works; Kurt K6RRA built the 1.2 and 2.3 Ghz loop yagis and picked up the Drake downconverter from Skycable; Eric KD6GLP is assembling a 10 Ghz radio; Jeff, KN6VR working with some image reject mixers; Matt, KE6ALM working with the 2 Ghz radio parts; Dan, KM6PO gathering parts for a 10 Ghz radio; Larry, K6HLH built the triband feed and picked up W6OYJ's big rotator; Paul, N6LL had some contacts; Chip, N6CA started the Heaps Pk 1200 MHz duplexer and the Palos Verde beacon is to be moving location.

Scheduling

4 June George, K6MBL Magnetron operation

13-14 June ARRL VHF QSO Party

27 June ARRL Field Day

2 July Doug, K6JEY Rubidium standards

1-2 August ARRL UHF contest

6 Aug. tech talk TBD

15-16 Aug. ARRL 10 GHZ and Up cumulative 1st half

3 Sept. tech talk TBD

12 Sept. ARRL VHF QSO Party

19-20 Sept. ARRL 10 Ghz and up cumulative 2nd half.

"Wants and Gots" for sale

Want- Yeasu FT-911 1.2 Ghz HT Dan Breig KM6PO 714-970-1715

Want WG-42 at least 6.5" long w/wo flanges Bob W6SYA 818-248-3683.

Got- 5.6 Ghz 20w amp Lloyd AB6SM 562-921-3202 novakent@loop.com

Got- HP-626 10-15 Ghz sig gen $50 Ken WB6DTA 815-848-9059

The Microwave Group of San Diego regrets to report the passing of Ray Harland, W7FRA, ex-N6AMD, a few weeks ago in Escondido. Ray was a long time operator and builder of VHF/UHF/and Microwave gear and was active in many of the ARRL 10 GHz contests dating back to the first in 1986. His favorite band was six meters, but he had built transverters for almost every band through 10 GHz. He had been in poor health for some time and

asked our group to help dispose and distribute as much as possible of his

collection of microwave equipment and parts. This has been accomplished.

We will miss Ray, he was a fine gentleman. W7FRA, SK. 73 from Ed Munn, W6OYJ

From the magazines- April 1998 QST "Above 50 MHz column reports that the 24 Ghz world record was expanded in Oct. 97 by F6BVA/p (JN02sv) to F5CAU/p and FA1ONQ/p (JN33du) to 398 km. Currently the North American record stands at 256 km in California during 1992. April 73 Amateur Radio Today "Above and Beyond" column by Chuck Houghton, WB6IGP (clhough@pacbell.net) discusses crystal oscillator multipliers, microwave "bricks" and phased-locked synthesizers as types of local oscillators used in making a transverter or receiver. May 98 CQ VHF "Final Frontier" column by WA5VJB covers new 76 Ghz record 7.6 mile contact by AA6IW-W0EOM.

From email- Paul Wade, N1BWT indicates he is cleaning up all the material on microwave antennas he has written and has placed some of it a Microwave Antenna Book ONLINE. His web site is http://www.qsl.net/n1bwt and click on N1BWT Microwave Antenna Book ONLINE to see his stuff. Al, K6LJM reports 18" DSS dishes available free for S&H cost at http://www.satmart.com.

ARRL PACIFIC DIVISION UPDATE MAY, 1998 by Brad Wyatt, K6WR, Director, Pacific Division, ARRL (408) 395-2501 K6WR@arrl.org--

Amateur Radio Spectrum Protection Act Introduced in House of

Representatives:- On March 27, Representatives Michael Bilirakis (R-FL-9th) and Ron Klink (D-PA-4th) introduced HR 3572, the Amateur Radio Spectrum Protection Act of 1998. The operational portion of the bill is Section 3 (see below), which, if passed, would require the FCC to provide "equivalent replacement spectrum" if the Commission reallocates any primary or secondary Amateur Radio frequencies. You can look up the full text of the bill on the House THOMAS web site at: http://thomas.loc.gov/cgi-bin/query/z?c105:H.R.3572:

The bill has been referred to the House Commerce Committee. While it is too early to offer any prognosis, the House only has about fifty days left actually in-session before the proposed October adjournment. Our strategy must be very straightforward - a simple numbers game of gathering as many House cosponsors as we can.

ARRL Asks FCC To Support Voluntary Band Plans:-On April 3, based on action taken at the January ARRL Board meeting, the League formally asked the FCC to issue a declaratory ruling to equate observance of voluntary band plans with "good amateur practice." The League requests the Commission "at an early date" declare that good amateur practice "anticipates compliance with the accepted voluntary international, national, and regional band plans adopted by

cooperation and coordination" within the Amateur Radio Service.

The League's filing builds on a 1983 declaration by the Chief of the FCC's Private Radio Bureau that simplex operation on a recognized repeater frequency was contrary to good amateur practice. A complete copy of the League's petition may be found on the ARRL Web site at http://www.arrl.org/announce/declreq.pdf.

2 Ghz equipment-- One Fallout of the spectrum auctions has been the 2 Ghz equipment that is now excess. While some of it has shown up in swap meets, some is "available" through other means. Some has been Harris/ Farinon gear. Several different "generations" of the equipment has been seen. Most is 10 years old or older. One of the things not showing up is information on the characteristics of this equipment. All of the equipment pieces seen to date have been on frequencies below 2000 MHz. Testing of several pieces has revealed that most will not operate above 2100 MHz as is. Many of the boxes were interconnected with isolators to assure performance under varying conditions. Most of the isolators do not function well above 2100 MHz. Some of the magnet tricks may get 5 % to move in to the 2300 MHz band. The system seemed to work with a 21.4 MHz IF on receive and 150 MHz on transmit. The mixers appear to be filtered by external circuit boxes so will work with a 144 MHz IF. The

LNA appears to function in the 2.3 to 2.4 Ghz band with a noise figure of about 4.5 dB. Most of the other amplifiers roll off at about 2100 MHz. One of the multistage linear power amplifiers was found to have an input 2 stage amplifier which would operate in the ham band with +19 dBm output and about 18 dB gain. The 5 pole filters came in two configurations, a single unit and a double filter unit. These have to have the posts milled down about 0.030" before they will tune in to the 2300 MHz band. The frequency lock LO puts out about +15 dBm on the original frequencies and with the replacement of the crystal will move up to 2160 MHz with adjustment of tuning screws. The power splitter appears to function at the higher LO frequency. So with a little work, the hardware can be moved into the 2300 MHz band.

As mentioned in previous newsletters, Chuck, WA6EXV took one of the few image rejection mixer boxes and came up with a phase shift board that operates at 144 MHz providing some 60 dB rejection to the image frequency.

Several people have picked up various system boxes from Dick, WB6DNX at the SBMS meetings.

One of the other fallout of the spectrum auctions was the lost of Amateur frequency spectrum. Use or lose it still applies. Bill, WA6QYR

Getting on Microwaves Zack Lau, W1VT, ARRL Laboratory Engineer

From: <info-serv@arrl.org> (HQ Automated INFO Server) file: uwave.txt update: October 24, 1994.

Updated and printed by WA6QYR with ARRL permission 4-14-98

The cheap way to get on microwaves is with 10 GHz Gunnplexers. The intrusion alarm sensors, while not optimized for communications, have been used for 83 mile contacts with horn antennas (conditions that day were very good). More typical distances are 20 to 40 miles, line of sight. Radar detectors often have 11.5 GHz Gunn transceivers inside that can be tuned into the amateur band.

In addition to the Gunn transceiver, you typically want to build an FM receiver to listen to other 10 GHz WBFM stations and a modulator to talk to other stations. The p. 32-45 of the 1993 ARRL Handbook describes how to hook 88-108 MHz FM radios to act as IF receivers. Page 32-54 of the same book shows how to modulate a Gunn diode with an LM317 regulator. Modulating the supply voltage allows even the cheapest Gunn transceivers to be used. They lack varactor diodes used for modulating expensive units.

The disadvantage of this system is that some groups insist on using a 30 or 33 MHz IF, none of which are compatible with each other or an FM radio IF. They are either using modified FM radios or distance measuring devices known as Telurometers. The latter was made by Pye Ltd of Cambridge in the UK and apparently has been available inexpensively in Canadian and Australian surplus stores. Also, you may wish to have a pair of units to insure that you have the proper offset to work anyone else in a group. Two gunn units on the same frequency will not be able to work each other. They have to be offset by the IF to work properly. Thus, one typically sets one unit to 10.25 GHz and the other to 10.28 GHz if one has a 30 MHz IF. This is the most common choice of frequencies.

Varactor tuned Gunn transceivers are also available. These have been selling for $66 from SHF Microwave Parts Company 7102 W. 500 S. La Porte IN 46350 does not deal by phone. They also have a variety of used and new Gunn transceivers for $20 and up, as well as related parts.

The varactor will let you tune to a variety of offsets., though you will need an FM receiver or receivers that will handle the different intermediate frequencies.

This is the cheapest approach known. One activity center for 30 MHz IF Gunnplexers is in Northern Vermont/VE3. If you don't live near an activity center, you might consider starting your own. One way to find out about such centers is to look at the 10 GHz contest listings.

However, the other approach is to use SSB/CW, which makes non-line-of-sight contacts much easier, though this approach is much more costly for most people.

In the Northeast, one of the stumbling blocks to promoting microwaves has been the reliance on 2 meter SSB/CW. Why? It turns out that 2M SSB/CW is the most effective way of coordinating microwave activities among distant stations. FM repeaters are an obvious solution that doesn't work. Some people don't appreciate extended communications on "their" repeater. Even simplex doesn't always work, as I've been reminded that some group intends to use 146.55 MHz in a few hours. Aside from the social problems, there remains the fact that FM is often a poor mode for coordinating schedules. If you are in the middle of everything, such as on Mt Greylock FM might actually be preferred. But

stations far to the North and South might find themselves "locked out" due to the capture effect associated with FM (weak signals are completely gone while a strong station transmits).

One possible solution is to plan your schedules ahead of time and stick to the microwave bands. This may not work if the roads to the hills are as deceptive as some CT roads. You see West Peak's Castle on your right as you get off exit 4 of Rt 691 west. But, to get there, you need to take a pair of lefts! People who have been there before have been known to take an extra hour to get there.

So why don't I just buy a 2 meter SSB rig? The two current options are the Yaesu FT-290R Mk II and the Kenwood TS-751A, which are fine radios except for there cost, which is usually over $500. What about a used one? Surprisingly expensive, often selling for around $400. Older base/mobile rigs such as the Icom IC-251 and the earlier Yaesu's can sometimes be had for $250, but these are pretty rare. The IC-202 can be had for as low as $150, but finding one for sale is quite difficult in metropolitan areas.

A possibility is to build your own SSB/CW 2M SSB radio. January and April 1993 QSTs show much how to build a low power (2 milliwatt) transceiver. The VHF/UHF DX Book describes a 2 meter transverter. The transmit stages of this transverter could be added onto the transceiver to get 10 watts of RF output.

Finally, it is possible to call CQ on 1296 and 902 MHz if you are in an excellent spot. However, merely being on the highest hill around for hundreds of miles may not qualify. Just as important is having people listen in your direction. The difficulty is many people are using antennas with high gain, and may only be able to look at 15 to 30 degrees of the azimuth at a time. As a result, people have gone to great spots and not worked anyone, because nobody pointed their beams that way. Down East Microwave sells a line of transverter kits for 432 to 5760 GHz.

**Microwave Bibliography and sources for microwave components.**

Zack Lau, W1VT, email: zlau@arrl.org

903 MHz 144 MHz IF transverter July 1991 QST p.25 20 mw output, under 4 dB NF. 28 MHz IF operation is possible if tighter filters are used. Unfortunately,

such filters normally require tuning or a precision machine shop. Precision teflon board filters are also possible, except that nobody has done the work necessary. Ordinary G-10/FR-4 is not made to high tolerances, so precision work with this involves adapting the design to each production run of board.

Recommended way of getting to 10 watts on this band is to buy a hybrid module, such as the Hitachi PF0011(DEM), and hook it up according to the data sheet.

DEM also sells kits. If linear operation in necessary, make sure your hybrid is linear. Many class C hybrids are available, though the newer ones tend to be linear to allow the power to be controlled.

125 watts, 10 dB gain. April 1988 QEX Two 7289s on 903 MHz. An air cooled amplifier that is rather complex mechanically to build. It is assumed that the builder knows how to build the amplifier in the March 1970 issue of

Ham Radio for 23 cm.

1296 MHz- 144 MHz IF transverter ARRL Handbook p 32-15. Boards are

available from DEM. Unfortunately, board artwork is not available from the ARRL.

28 MHz IF transverter ARRL Handbook 32-5. Requires a fair amount of tuning to get going.

10 mw to 3 watt power amplifier. 1993 ARRL Handbook p. 32-18. DEM sells kits and parts. The only critical traces on the circuit board are the input and output 50 ohm microstrips. They could be replaced with coax.

7 and 18 watt power amplifiers. 1993 ARRL Handbook p. 32-19. Perhaps superseded by hybrid modules such as the M57762. These are available from DEM and RF Parts.

250 watt amplifier. 1993 ARRL Handbook p. 32-29. 2C39 tube operated in excess of rating, but is the most common way of generating lots of power on this band. Lots of metal work needed. Caution is needed, since this much power can easily be dangerous.

Power combining 250 watt amplifiers to get 400 watts.April 1991 QST pp. 28-30

2304 MHz.- No-Tune Transverter Dec 1992 QST. Artwork is available from the Technical Department secretary. A 0.8 dB NF 14 dB gain preamplifier appears in the May 1989 QST, p 31-36 and the ARRL 1993 Handbook p. 32-22 to 32-28. While no-tune, adjusting the bias current is sometimes necessary for optimum performance with these preamps.

If a 14 or 15 volt supply is available, the Avantek UT0-2013 hybrid module in a TO-8 case will deliver 20 dBm. This unit is sometimes available in surplus assemblies. The ATF-10135 [ATF-10136 now standard part. Avantec dropped the 10135. WA6QYR] may work as a power amplifier, except that device variations

(within specifications) as well as biasing/stabilizing circuit limitations often limit the power below its 20 dBm power specification.

A repeatable no-tune 2304 power amp has yet to be published for getting above the 20 mw level. The adventurous may wish to take nearly any power GaAs FET available, put it on a board with half wavelength 50 ohm traces, bias it according to the manufacturer's specification sheet (or whatever seems reasonable), and tune it for maximum output power with copper foil. A major difficulty is that power GaAs FETs basically aren't designed for 2 GHz operation in mind--perhaps indicating the lack of a big customer. 28 volt

bipolar devices are available, except that amateurs don't seem to be interested enough to develop designs.

3456 MHz. No-Tune Transverter June 1989 QST. Etching your own high accuracy teflon board isn't recommended, though the author will supply artwork. Most people buy etched boards from DEM.

A 0.9 dB NF 23 dB gain preamplifier appears in the May 1989 QST, p 31-36 and the ARRL 1993 Handbook p. 32-22 to 32-28. While no-tune, adjusting the bias current is sometimes necessary for optimum performance with these preamps.

WA8NLC sells a pair of boards for using the AT-8140 and Avantek IMFET. The AT8140 should put out a watt with 10 dB of gain. The IM2935-3 IMFET costs about $300+ new, but is one way to get 4 or 5 watts on this band.

Much of the high power work is done with surplus TWTAs and solid state amplifiers.

5760 MHz. Simple transverter with no RF amplifiers. A Single-Board

Bilateral 5760 MHz Transverter," QST October 1990 pp. 27-31.

Mixers, filters, and low level (4 mw??--data sheet says 5 mw at 4 GHz) amplifier. 1992 Microwave Update. Mixers, etc. for 5760 MHz, Paul Wade p71-79.

A 1.2 dB NF 18 dB gain preamplifier appears in the May 1989 QST, p 31-36 and the ARRL 1993 Handbook p. 32-22 to 32-28. While no-tune, adjusting the bias current is sometimes necessary for optimum performance with these preamps.

Much of the high power work is done with surplus 5 watt solid state amplifiers and TWTAs.

10 Ghz. A transverter for duplication by experienced microwave experimenters has been written up for QST and is currently being edited. It puts out 10 to 20 mw and has a noise figure under 3 dB.

The Microwave Update 1991 and the Microwave Handbooks by the RSGB describes some kits sold by Petra, G3WDG's XYL. The kits will run about $500 U.S. The claimed noise figure is 3 dB and the saturated power output is +20 dBm. There are many tuned stages to adjust for proper operation. (circa March 92).Petra Suckling 314A Newton Road RUSHDEN Northants NN10 0SY UK Tel 8-01144-993-411446

NF 18 dB gain preamplifier appears in the May 1989 QST, p 31-36 and the ARRL 1993 Handbook p. 32-22 to 32-28. While no-tune, adjusting the bias current is sometimes necessary for optimum performance with these preamps.

A 0.8 dB NF 11 dB gain preamp appears in the Dec 1992 QEX. A template is available for an sase from the Technical department secretary.

SHF Microwave Parts Company 7102 W. 500S. La Porte IN 46350. She sells a wide variety of 10 and 24 GHz Gunn modules (new and used), as well as a small selection of parts and small horn antennas.

For the Really Ambitious:

5.7 and 10 GHz transverters that put out over 1 watt, 100 mw 24 GHz transverter. Noise figures are 2.4, 3.0, and 4.0 dB for the LNAs. Parts availability could be a problem, as the author is Japanese. Microwave Update 1992 5.7-GHz, 10-GHz, and 24-GHz All-Mode Linear Transverter p.100-146.

SSB/CW Equipment concepts for 24 and 47 GHz. 1989 Microwave

Update. How you might go about building equipment for these

bands, assuming you can find the right pieces. It took Tom two years before serious construction of the 47 GHz unit could begin, and he knew what he was doing.

24 GHz Low Noise Amplifiers. 1991 Microwave Update. How to build amplifiers that take hours to tune up, even with experience and expertise. 10.8 dBm output for the best transmit amp, 3.5 dB NF for the best LNA.

Various Parts Sources

Mainline Electronics P.O. Box 235 Leichester LE2 9SH England

has MGF1302, MMICs, and other semiconductors Dayton 92

DEM=Down East Microwave

954 Rt. 519 Frenchtown, NJ 08825 phone 908.996.3584 fax 908.996.3702 http://www.downeastmicrowave.com.

M/A-Com Semiconductor Products Inc. Burlington MA 01803 Phone 617-272-3000

Probably not as helpful to amateurs as when the company was owned by a well known amateur.

Advanced Receiver Research Box 1242 Burlington CT 06013 is a distributor for MA/COM. phone 203-582-9409. They sell complete Gunnplexer transceivers with genuine FM for 10 and 24 GHz.

Publications: RSGB Microwave Handbooks vol 1 (1989) vol 2 (1991) vol 3 (1992); VHF/ UHF Handbook 1997. ARRL UHF/Microwave Experimenter's Manual (1990)and UHF/ Microwave Projects Manual Vol 1 (1994) and Vol 2 (1997).

Where to Get the Pieces

Here's a list of vendors that supply the parts used in the 10-Ghz transverter. Catalogs and/or price lists are available from each listed supplier.

Down East Microwave, 954 Rt. 519 Frenchtown, NJ 08825, tel 908.996.3584, fax 908.996.3702, and Steve Kostro, N2CEI.: MMICs, MGF1302, chip capacitors, SMA connectors, mixer diodes (only DEM carries the HSMS 8202; both stock the HSMS 2822).

Mainline Electronics, PO Box 235, Leicester LE2 9SH, England: MGF1302, MMICs, transistors, voltage regulators.

Nemal Electronics, 12240 NE 14 Ave, N Miami, FL 33161, tel 305-893-3924: SMA connectors, semirigid cable.

Ocean State Electronics, PO Box 1458, Westerly, RI 02891, tel 401-596-3080, fax 401-596-3590: LM555, 78L05, 2N3906, 2N2907A, ICL7660, 1/4-watt carbon-film resistors, electrolytic capacitors, tantalum capacitors.

SHF Microwave Parts Co, 7102 W 500 St, La Porte, IN 46350 219.785.442 http://wwwshfmicro.com: HSMS 2822, MMICs. Also sells Gunn transceivers.

Small Parts, PO Box 4560, Miami Lakes, FL 33014, tel 305-557-8222: brass sheet stock, stainless-steel screws, #2-56 taps, many other items of interest to microwave-equipment builders.

RF Parts, 1320 Grand Ave, San Marcos, CA 92069, tel 619-744-

0700, fax 619-744-1943: MGF1302.

Directive Systems RR#1 box 282 Dixon Road Lebanon ME 04027 207.658.7758 fax 207.658.4337 loop yagis 800-3500 MHz.

*** This is not intended to be a complete list of dealers that carry these products.